through which was passed the current from sixty-four large Bunsen elements. A little sulphide of carbon was introduced into the inner tube, and the air having been driven out by vapour forming at ordinary temperature, the tube was closed and fixed in position, and steam was sent through the space round it.

When the whole tube had taken the temperature of boiling water the glass plates and the sulphide of carbon vapour within became quite transparent. A beam of light rectilinearly polarised by a Nicol was now sent through, and a Nicol at the other end extinguished it. The current of the sixty-four elements being now allowed to flow, a distinct brightening of the field was observed. The brightening became still greater when, after closing the circuit, the foremost Nicol was turned to darkness, and the current then reversed with a commutator. The rotation of the plane of polarisation occurred, as was to be expected, in the direction in which the positive current passed through the wire coils.

To test whether the rotation might not be due wholly or in part to the glass plates closing the inner tube, the experiment was made without any sulphide of carbon in this tube. A weak rotation, due to the glass, was indeed observed, much smaller than in the other case. To avoid this, however, as much as possible, the wire coils next the glass plates were shut out from the circuit. The four coils now traversed by the current were so far from the plates that their influence must have been very small, indeed the plates then gave no perceptible rotation. Sulphide of carbon having been again admitted, and the experiment repeated, there was a well-marked brightening as before, when the current passed. The amount was roughly estimated at half a degree.

It is thus proved that saturated sulphide of carbon vapour at about 100°, *in the magnetic field, rotates the plane of polarisation of light.*

Sulphuric ether was tried in the same way, but gave no effect. The authors consider it can hardly be doubted that, with suitable arrangements, the rotation may be demonstrated in the case of unsaturated vapours and gases. They are engaged in making an apparatus which will enable them to examine permanent gases at very high pressures in the magnetic field, in order to prove the rotation in their case, and, if possible, to measure the phenomenon. "It would be specially interesting," they remark, "to ascertain whether oxygen rotates the plane of polarisation in the same direction as other gases."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

A BROAD and liberal scheme has been published by the Cambridge Syndicate on the affiliation of local Colleges to the University as suggested in various Memorials. They have taken a large amount of evidence and have had interviews with deputations from Nottingham and Sheffield. They have also held conferences with a Committee of the Hebdomadal Council of the University of Oxford, with whom they find themselves in general agreement. The Syndicate recommend that application be made to the University of Cambridge Commissioners for the powers required to enable the University to affiliate local Colleges, and that the following conditions of affiliation be established by grace of the Senate. Any educational institution within the British dominions, in which the majority of the students are over seventeen years of age, may be admitted on condition that it be incorporated by Royal Charter, or established on a permanent and efficient footing; that the University shall be represented on its Governing Body, and undertake the general conduct of its Examinations; and that the connection between the University and an affiliated College shall be established and shall be terminable by a grace of the Senate, or by a resolution of the Governing Body of the College. Persons who have completed an approved course of three years at an affiliated College, passing satisfactorily the Examinations connected with that course, will be entitled to receive a University Certificate, and if they obtain honours in the final Examination connected with that course, shall be excused the previous Examination; and provided they obtain a degree by one of the Tripos Examinations will be permitted to take their degree after only six terms' residence at Cambridge. In each College there are to be three examinations yearly, the Annual College Examination, the First and the Second Examinations, the Annual College Examination is to be held in subjects taught with the sanction of the University, in the College, and be open to those students only who have satisfactorily attended the teaching in these subjects. To pass the First Examination every candidate will be required to satisfy the Examiners in (1) Arithmetic; (2) Euclid, Books I., II., and III.; and Algebra, to Quadratic Equations inclusive; (3) One of the following languages: Latin, Greek, French, Italian, German. Candidates will be at liberty to take up more than one language, and one or more additional subjects, including Heat, Experimental Mechanics, Chemistry, Botany, and Mathematics. 4. The Second Examination shall include four groups: (1) Ancient and Modern Languages, two to be taken. (2) Mathematics, one higher subject, pure or applied, being required. (3) Natural Science. Candidates pass in Elementary Chemistry and Physics, and also in one of the following:—Higher Chemistry, Higher Physics, Animal and Vegetable Physiology, Comparative Anatomy with selected portions of Zoology, Vegetable Anatomy and Physiology with Classificatory Botany, Geology and Physiography, Mineralogy. Candidates to pass in (1) English Constitutional History and (2) Political Economy or Logic, and subjects connected with History, Literature, and Philosophy. A pass in one group will give a pass in this second examination, and honours may be obtained on the minimum number of subjects. The Syndicate think it desirable to avoid if possible increasing seriously the severe strain caused by the outside work of the University. The sections and groups of the senior and higher local examinations are in general correspondence with the scheme, and the lectures at the centres are under the superintendence of the Syndicate for conducting local examinations and lectures. Thus there is machinery in existence which may, with some modifications, be conveniently and properly used. It is thought desirable that the Universities of Oxford and Cambridge should, as far as practicable, act in concert in conducting this great scheme of affiliation. It is recommended that the scheme be so administered as to be self-supporting.

THE Cambridge Council of the Senate propose to repeal entirely the few unrepealed provisions in the will of Dr. Woodward relating to the Professorship of Geology, and to frame a new statute on a plan already approved for the Professorship of Chemistry. The same plan is likely to be followed with regard to the chairs of Anatomy, Botany, and Mineralogy, the nomination of half the Electoral Board in the case of anatomy falling to the Board of Medical Studies and in the other professorships named, to the Board of Natural Science Studies.

IN consequence of the greater importance to be given in future to the first part of the Cambridge Natural Sciences Tripos, held in June, a practical and oral examination is to be held then, two extra days being allowed for this.

THE Higher Senior Class of Mathematics in University College, London, which had been conducted by the late Prof. Clifford, has been intrusted during the summer term of the present Session to Mr. M. J. M. Hill, M.A., Fellow of the College, and fourth wrangler and bracketed equal Smith's prizeman this year at Cambridge.

DR. WITTROCK, the well-known algologist of Upsala, has been appointed lecturer on Botany, and curator of the botanical section of the museum at Stockholm.

THE commission of the Chamber of Deputies proposes to establish a compulsory system of education in France. Parents neglecting to comply with the provisions of the law are to be fined, and in certain cases to be sent to prison for a certain period. The expenses required for enlarging school accommodation and adding to the number of teachers are to be supported by the National Exchequer.

SCIENTIFIC SERIALS

American Journal of Science and Arts, March.—In the opening paper Prof. Norton contends that under varying conditions the ultimate molecules of bodies are subject to changes in the intensity of their attraction or repulsion, at a given distance of neighbouring molecules (temperature and chemical constitution remaining constant). Evidence of this is found in the phenomena of permanent distortion of materials after temporary subjection to a force of stress; in observed changes in the mechanical properties of materials, through tension, pressure, heat, &c.; change of mechanical properties of a body through presence of minute quantities of other substances; and certain facts in chemical physics (phenomena of solution, allotropy, the nascent

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state, &c.). The hypothesis is advanced, that the ethereal atmosphere condensed round an atom by its attractive action consists of an atmosphere of luminiferous ether, and an envelope of electric ether immersed within this for a certain depth, an ethereo-electric atmosphere, in fact.—Some observations on flocculation of small particles (or their tendency to form, under moderate agitation, granular aggregates or compound particles of larger size), are described by Prof. Hilgard, and have important physical and technical bearings, especially on points in agriculture.—Prof. Dawson points out what he considers defects and errors in the method of investigation pursued by Prof. Möbius recently with regard to *Eozoon canadense*, leading to a decision adverse to the organic character of that object.—Mr. White offers some remarks on the Jura-trias of Western North America; Mr. Fontaine continues his notes on the mesozoic strata of Virginia, and Mr. Bannister contends for the hypothesis of the transition character of the Rocky Mountain lignite series, or Laramie group.—Some new species of anthozoa and cephalopoda added to the marine fauna of the eastern coast of North America, are described by Prof. Verrill; the cephalopoda have some specially interesting features.—Mr. Penfield gives analyses of triphylite.

Annalen der Physik und Chemie, No. 2.—In this number Herr Thoss communicates an interesting paper on artificial dichroism. He experimented (to produce it) in the three directions of making a coloured isotropous medium doubly refractive, colouring a doubly-refractive medium, and giving a colourless isotropous medium both colour and double refraction. The last series were negative in results. In the first series, plates of gutta-percha, indigo, and chrysamminate of potash gave convincing proof that there is no difference between double refraction produced mechanically and double refraction in crystals. It was found impossible to produce dichroism with pressure in coloured glass. Colouring matter in crystals is considered the real producing cause of dichroism. The subject of quickly alternating electric currents is treated by Herr Oberbeck, who notes as an important fact the diminution of the resistance of liquids by increase in the number of alternations of the transmitted current in unit time; this occurs only when the number becomes high, and the average time of passage of one constituent molecule to its neighbour in the direction of the current can no longer be regarded as infinitely small in comparison to the duration of the current. The author describes experiments on alternating currents in two induction coils, variously connected, and finds in the phenomena certain analogies to vibrations of the nature of sound and light.—Herr Lubarsch endeavours to show that the faultiness of past experiments on fluorescence has arisen only from the first of three causes assigned by Prof. Lommel, viz., absorptive action of the fluorescent liquid on the fluorescent light, in observation of the liquid mirror. He finds evidence of the generality of this law: in all fluorescent substances the more refrangible limit of the derived spectrum coincides with the place of strongest absorption in the absorption spectrum, or (where this is not distinctly perceptible) with the place of strongest fluorescence in the fluorescent spectrum. Substances with double fluorescence, as chlorophyll (the phenomena of which he describes), are not excepted from the law.—Herr Rudorff describes a simple and convenient apparatus for determining the specific gravity of powdered substances; Herr Wiedemann and Herr Schulze, an arrangement with which can be proved the dissociation of hydrate of chloral at 100°; Herr Wiedemann, experiments yielding the result that by passage of electricity a gas may become luminous far under 100°, &c.—A large part of the number is occupied with the concluding part of Kohlrausch's paper on electric conductivity, &c., already referred to.

Journal de Physique, February, 1879.—The opening paper by M. Jamin, on complements to the theory of dew is followed by one in which M. Lippmann shows that the depolarising property of a metallic solution is limited to the same metal as it contains; and that this electric reaction may be applied, in several cases, in testing for a metal, as a convenient auxiliary of chemical analysis. The electric work expended to produce polarisation is stored (he contends) not in the form of chemical energy, but in that of electrical, as in a condenser.—M. van der Mensbrugghe offers some remarks on measurement of the superficial tension of liquids, *apropos* of recent experiments by M. Terquem.—M. Gernez describes a method of observing the rotatory power of quartz at different temperatures, and which seems to meet the difficulties of the case better than that of M. Joubert and other physicists. Two quartzes of contrary rotation are fixed at the two ends of a tube, and only one is heated. A universal support or electro-diapason for inscribing and showing in projection vibratory movements is described by M. Duboscq.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 27.—"On the Organisation of the Fossil Plants of the Coal Measures. Part X." By W. C. Williamson, F.R.S., Professor of Natural History in Owens College, Manchester.

The still existing differences of opinion respecting the botanical affinities of the Sigillariæ give value to every new fact calculated to throw light upon the question. In 1865 Mr. Edward Wunsch, of Glasgow, made a discovery, which proves to have an important bearing upon it. He found, at Laggan Bay, in Arran, a series of rather thin carboniferous strata, separated by thick beds of volcanic ash, and in one of the carboniferous shales especially, he discovered the bases of the stems of numerous very large trees standing perpendicularly to the shales. These trees have been referred to by several authors as Sigillarian. In the summer of 1877 Mr. Wunsch and I employed quarrymen to make extensive excavations amongst these strata, for the purpose of adding to the extensive series of specimens which he had obtained, and the whole of which he kindly placed in my hands. The aggregate result of these explorations was to show that the conclusion previously arrived at, viz., that the stems had belonged to a grove of Sigillarian trees, was unsupported by a solitary fact. These stems were of very large size, showing that they had belonged to fully grown trees. None of them displayed any traces of leaf-scars, having outgrown the stages at which such scars would remain visible. Their outer surfaces were scored with deep irregular longitudinal fissures, resulting from internal growth and consequent expansion, and which appear to have been mistaken for the longitudinal grooves and ridges of a Sigillarian bark. Such, however, they certainly were not, since, in every instance, the surface bark had been entirely thrown off, and the fissures entered deeply into the subjacent bark layer. In most of the stems this comparatively thin bark layer was the only one that remained, the greater portion of the inner bark and the central vascular axis having disappeared, leaving a large cylindrical cavity, which was filled up with volcanic ash. These stems failed to display a single feature justifying the conclusion that they were Sigillarian.

In two of them the central cavity, instead of being filled with ash, was filled with miscellaneous heaps of vegetable matter, amongst which were large fragments of the vascular axes of various plants, such as Lepidodendra and Stigmariæ, but in one of the largest stems were five or six decorticated vascular cylinders of Diploxyloid stems, of the largest size, and which, though arranged parallel to the long axis of the cylinder which inclosed them, obviously did not belong to them, but had been floated in from without. The supposition that these had been young stems that had grown within the hollow protecting cylinders, from spores, accidentally introduced, is wholly untenable, since each one of these several vascular axes has been the centre of a stem fully as large as that within which we found them aggregated. Of course, these Diploxyloid vascular axes had the organisation which Brongniart and the younger school of French botanists which still upholds his views on this point, believe to be characteristic of true Sigillariæ—a conclusion from which I have long dissented.

The only fragments we found, that threw any light upon the character of the leaf-scars that had indented the surfaces of these fully-grown stems, was a well-defined example of the Lepidodendroid type.

We directed careful attention to the nature of the smaller fragments of branches and foliage which abounded in the volcanic ash with which the large stems were overlaid. These consisted of Lepidodendroid branches and twigs of all sizes and ages, and no doubt was left upon my mind that they were really the *disjecta membra* of the stems around which they were so profusely scattered. The only fruits that have been obtained from the same locality are Lepidostrobi, most of which contain macrospores and microspores. Unless we are prepared to believe that this Arran deposit contained, on the one hand,

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